



Surgical management of complicated right colon cancer

Lazar M, Cartu D, Patrascu S, Preda D, Margaritescu D, Bratiloveanu T, Bica M, Surlin V.
University of Medicine and Pharmacy of Craiova, Department of General Surgery

Abstract. The management of complicated right colon cancer has a standard recommendation represented by right colectomy with primary anastomosis. There seems to be an important percentage of patients for whom a damage control type procedure can be performed as a first step of a two-stage intervention with great benefits for their postoperative outcome.

Material and method: We studied complicated right colon cancer patients admitted to our clinic during the last 23 years. We analysed the surgical procedure performed and postoperative morbidity and mortality. We aimed to track the evolution of the surgical strategies used in the treatment of complicated right colon cancer and to observe the potential need for two stage procedures for patients with high risk of postoperative morbidity and mortality. **Results:** Three groups observed: G1 – 2001-2010, (23 patients); G2 – 2011-2016, (20 patients); G3 – 2017-2023, (27 patients). We registered significant increase in single stage procedures from G1 to G2 (52.1% vs. 75%) In G3, single stage procedure rate remained similar to G2 (74.1 vs. 75%). Postoperative morbidity and mortality decreased from G1 to G2 and G3 for both single and two-stage procedures and was significantly higher for single stage procedures in G1 compared to two-stage procedures whereas in G2 and G3 the single stage and two-stage procedures had similar morbidity and mortality. **Conclusion:** In complicated right colon cancer the standard procedure to perform in emergency setting is right colectomy with ileo-colic anastomosis although damage control type procedures may sometimes provide a safe alternative as first stage of a two-stage intervention.

Keywords: right colon cancer, complication, emergency surgery, damage control

Introduction

Colorectal cancer represents the third most frequent malignancy worldwide. The incidence of colorectal cancer surpasses one million new cases per year. [1] Up to 14% - 33% of these patients present as emergencies with bowel obstruction, perforation or bleeding. [2, 3] These cases usually have more aggressive cancers with worse prognosis than elective cases. [4]. Emergency surgery for complicated colorectal cancer needs to consider tumour topography (right or left colon, rectum), the specific complication (obstruction, perforation, bleeding), patient's age, general status and nutritional state. Also, time from onset to presentation is of utmost importance. There is a general consensus regarding complicated right colon cancer that promotes right colectomy with

ileo-colic anastomosis as standard treatment. [5, 6]

But an anastomosis performed on a distended colon with vascular deficit of the colonic wall can lead to a high risk of

Corresponding author: Bica Marius, email: marius.bica@umfcv.ro

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postoperative morbidity. Nevertheless, primary resection with anastomosis can be performed with safety for selected cases. For complicated right colon cancer cases the distention of the distal ileon should be moderate or the distended segment needs to be resected. These interventions may prove challenging for a young on-call surgeon and would best be reserved for colorectal specialists, if available. There is still a high percentage of cases that may not be indicated for resection with anastomosis. [7, 8, 9, 10]

Although the classic management is to treat both the cancer and the complication with just one procedure, there is a new approach emerging due to concerns of emergency surgeons' qualifications and the patient's status, with basis adapted from trauma surgery. This "damage control" type management, initially used for trauma patients, can be extended to non-trauma settings. [11] This approach suggests that the complication should be treated first, with emergency surgery when minimal and targeted procedures are performed in order to control the acute condition. During this time the patient is stabilized thus delaying the curative treatment of the colon cancer until the patient is more prepared to undergo the definitive procedure and possibly have his surgery performed by a colorectal specialist. [12]

Material and methods

We performed a retrospective analysis of patients with complicated right colon cancer admitted to our department with subsequent emergency surgery between 2001 and 2023. The study took into consideration the ethical tenets specified in the World Medical Association Declaration of Helsinki. All subjects provided written informed consent. Approval for the study protocol was obtained from the Ethics Committee of the University of Medicine and Pharmacy of Craiova.

Inclusion criteria were represented by emergency admission, a confirmed diagnosis of complicated right colon cancer, and emergency surgery. Exclusion criteria were diagnoses of benign colon pathology, instances of ambulatory admission, and elective surgical procedures.

The aim of this study was to track and record the evolution of the surgical strategies used in the treatment of complicated right colon cancer, focusing on the controversy between performing primary anastomosis or two-stage procedures. While the right colectomy with ileo-colic anastomosis is a general consensus regarding the standard management of complicated right colon cancer, there may still be a need for two stage procedures for patients with high risk of postoperative morbidity and mortality.

An analysis of the surgical interventions employed was conducted, noting the change in management across the three defined temporal intervals: first period, from 2001 to 2010, second phase spanning from 2011 to 2016, and a final period from 2017 to 2023.

Additional studied variables comprised of postoperative complications, overall morbidity, and mortality rates. Categorical variables were presented as absolute values with their corresponding percentages.

Research data was uploaded to the electronic database and the statistical analysis was performed using *Microsoft Excel* (Microsoft, Redmond, USA). For normally distributed values, the t-Student's test and χ^2 test were used to assess potential statistically significant differences between the two groups. The statistical significance level was considered for $p < 0.05$.

Results

We divided the 23-year period of time into three consecutive intervals, thus establishing three distinct groups of patients. The first group, designated as Group 1 (G1), comprised individuals with complicated right colon cancer who were admitted and underwent emergency surgery between 2001 and 2010. Group 2 (G2) included patients diagnosed with complicated right colon cancer admitted for emergency surgical intervention between 2011 and 2016. Group 3 (G3) consisted of patients with complicated right colon cancer admitted and operated upon from 2017 to 2023. 368 patients diagnosed with colon cancer were admitted to our department between 2001 and 2010, comprising both emergency and elective admissions. Among

these, 119 patients were diagnosed with complicated colon cancer. Emergency cases accounted for 32.3% of all colon cancer admissions during this period. 23 patients were diagnosed with complicated right colon cancer, representing 19.3% of emergency cases. These 23 patients met the criteria for admission in Group 1.

Group 2 included 20 cases of complicated right colon cancer admitted between 2011 and 2016. They represented 23.5% of the 85 complicated colon cancer cases during that period of time. Total number of patients diagnosed with colon cancer in the second period of time was 265 making all emergency colon cancer interventions 32% of all colon cancer procedures, emergency and elective.

Between 2017 and 2023, there were 317 patients diagnosed with colon cancer. Among these cases, 104 patients underwent emergency surgery accounting for 32.8% of all colon cancer admissions. 27 cases met the criteria for inclusion in Group 3, being diagnosed with complicated right colon cancer (25.9% of all emergency cases).

Among patients in Group 1, 12 single-stage procedures were performed, specifically right colectomy with ileo-colic anastomosis, accounting for 52.1% of complicated right colon cancer cases. Alternatively, two-staged procedures were preferred in 11 cases within Group 1, with 4 cases undergoing internal diversion (17.4%) and 3 cases undergoing caecostomy (13.04%) as the initial stage. 2 patients underwent diverting ileostomy (8.7%)

and in other 2 cases right colectomy with ileostomy was performed, representing 8.7% of emergency surgery for right colon cancer. Only 8 out of 11 patients (72.7%) underwent the second stage procedure at our facility. This data is presented in Tables 1 and 2.

The procedures performed in Group 2 were: right colectomy with primary anastomosis for 15 patients representing 75% of the group, internal diversion for 2 patients (10%), diverting ileostomy in one case (5%) and right colectomy with ileostomy in 2 cases (10%). 3 of the 5 patients with two stage procedures came back to our clinic for the second procedure at 4-6 weeks. (Tables 1 and 2)

Among the patients belonging to Group 3, 20 cases (74.1%) underwent right colectomy with primary anastomosis, while 7 individuals (25.9%) underwent two stage interventions. There were 2 patients that underwent internal diversions (7.4%), 2 patients (7.4%) that had diverting ileostomy performed and 3 patients benefited of right colectomy with ileostomy (11.1%). Notably, 5 patients who initially received diversions subsequently underwent right colectomy or ileo-colic anastomosis, representing a return rate of 71.4%. (Tables 1 and 2)

We conducted a comparative analysis of the surgical approach across the three patient groups. Specifically, for right colon cancer, we observed a progressive escalation in the proportion of single-stage surgeries from Group 1 to Group 2 (52% to 75%), followed by a comparable percentage in Group 3 (74.1%). (Tables I and II)

Table I: Emergency surgery treatment strategy during the three consecutive timeframes

Topography No of pts. %	Single-stage procedures			Two-stage procedures					
				Stage I			Stage II		
	G1	G2	G3	G1	G2	G3	G1	G2	G3
Right colon	12/23 52.1%	15/20 75%	20/27 74.1%	11/23 47.9%	5/20 25%	7/27 25.9%	8/11 72.7%	3/5 60%	5/7 71.4%
Total	23	20	27	23	20	27	11	5	7

Table II: Emergency procedures for right colon cancer patients

Procedure – stage I	G1	G2	G3	Procedure – stage II	G1	G2	G3
Internal diversion	4 17.4%	2 10%	2 7.4%	Right colectomy	3/4 75%	1/3 33.3%	1/2 50%%
Caecostomy	3 13%	-	-	Right colectomy	2/3 66%	-	-
Diverting ileostomy	2 8.7%	1 5%	2 7.4%	Right colectomy	1/2 50%	1/1 100%	2/2 100%
Right colectomy with ileostomy	2 8.7%	2 10%	3 11.1%	Ileo-colic anastomosis	2/2 100%	1/2 50%	2/3 66.6%
Right colectomy with anastomosis	12 52.1%	15 75%	20 74,1%	-			
Total	23	20	27	Total	8/11 72.7%	3/5 60%	5/7 71.4%

Postoperative morbidity for patients with complicated right colon cancer from Group 1 was significantly higher for single stage procedure cases compared with two-stage procedures (χ^2 test, $p < 0.05$). There were 2 patients with anastomotic leak (17% fistula rate), one was treated conservatively and one developed peritonitis and required surgical reintervention. Other mild postoperative complications (grade I and II on Clavien-Dindo classification) included wound infection in 5 cases and urinary infection in 3 patients. There was one death due to sepsis following anastomotic leak and peritonitis. Among the two-stage procedure cases there were 5 cases of wound infection and 2 cases of urinary infection after the first stage procedure and 1 case of wound infection after the second stage procedure. (Table III)

We analysed postoperative morbidity and mortality for the cases in Group 2 and found no significant differences between the single stage procedure cases and the two-stage procedure cases (χ^2 test, $p > 0.05$). For single stage cases we registered 1 anastomotic leak (6.6%), one case of sepsis that was treated conservatively and 1 case of minor pulmonary embolism. Other mild complications were wound infection (2 cases) and urinary infection (2 cases).

For two stage procedures there were 2 wound infections and 2 urinary infections. There were no deaths in either single or two-stage cases. (Table 3)

Postoperative morbidity and mortality for complicated right colon cancer patients in Group 3 were similar for single stage and two-stage procedures (χ^2 test, $p > 0.05$). For single stage procedures there was one case of anastomotic leak that led to peritonitis and sepsis. Other mild complications were: 3 wound infections, 2 urinary infections, and one pneumopathy. In the two-stage procedure cases we registered only mild complications, including one case of wound infection and one urinary infection after the first stage procedure, and one wound infection and one pneumopathy after the second stage surgery. Mortality was 5% (1 case) for single stage procedures and no mortality after the two-stage procedures. (Table 3)

When examining morbidity and mortality among patients with complicated right colon cancer across the three groups, our analysis revealed significantly elevated rates of both morbidity and mortality in Group 1 in comparison to Group 2 ($p < 0.05$). Conversely, Groups 2 and 3 exhibited comparable rates of morbidity and mortality ($p > 0.05$). (Table 3)

Table III: Group 1 vs. Group 2 vs. Group 3:
Postoperative morbidity and mortality

Complication	Single-stage procedures			Two-stage procedures					
				Stage I			Stage II		
	Gr. 1 12 pts.	Gr. 2 15 pts.	Gr. 3 20 pts.	Gr. 1 11 pts.	Gr. 2 5 pts.	Gr. 3 7 pts.	Gr. 1 9 pts.	Gr. 2 3 pts.	Gr. 3 5 pts.
Wound infection	5/12 41.6%	2/15 13%	3/20 15%	5/11 45.5%	1/5 20%	1/7 14.2%	1/9 11%	1/3 33%	1/5 20%
Anastomotic leak	2/12 17%	1/15 6.6%	1/20 5%	-	-	-	-	-	-
Peritonitis	1/12 8.3%	-	1/20 5%	-	-	-	-	-	-
Urinary infection	3/12 25%	2/15 13.3%	2/20 10%	2/11 18%	1/5 20%	1/7 14.2%	-	1/3 33%	-
Pulmonary thromboembolism	-	1/15 6.6%	-	1/11 9%	-	-	-	-	-
Sepsis	1/12 8.3%	1/15 6.6%	1/20 5%	-	-	-	-	-	-
Global morbidity	8/12 66.7%	5/15 33.3%	4/20 20%	7/11 63.6%	2/5 40%	2/7 28.4%	1/9 11%	1/3 33%	1/5 20%
Mortality	1/12 8.3%	-	1/20 5%	-	-		-	-	-
P (<i>chi</i> ² test) Comparison between groups	G1/G2 – p<0.05 – signif. G2/G3 – p>0.05 – non signif.			G1/G2 – p<0.05 – signif. G2/G3 – p>0.05 – non signif.					
P (<i>chi</i> ² test) Comparison between strategies within each group	G1 – Single stage/II stage – p<0.05 – signif. G2 – Single stage/II stage – p>0.05 – non signif. G3 – Single stage/II stage – p>0.05 – non signif.								

Discussion

Emergency surgery for complicated colon cancer is still a challenging part of a surgeon's practice not only because of the technical difficulties implied by colorectal procedures but also because of the difficult choice of the procedure he needs to perform. For complicated right colon cancer there seems to be less controversy regarding the surgical interventions. Right colectomy with primary anastomosis is considered the standard treatment. Even in emergency setting, the risk of anastomotic leak is less than 5%. [6, 13] Nevertheless, there are still cases of complicated right colon cancer where a two-stage procedure may prove to be the safer approach. This implies a damage control type as first procedure followed by the second, definitive surgical intervention. Of course, colon resection with primary anastomosis has some advantages, such as the avoidance of subsequent surgery with the risk of further morbidity and mortality. Also, the absence of tumor progression in the time between the first stage procedure and the definitive surgery is an important benefit. Previous studies have shown comparable postoperative evolution and long-term oncological outcomes between patients undergoing emergency procedures and those undergoing elective surgery. [14-17]

In patients with resectable tumours, both available approaches (immediate or delayed resection after damage control surgery) are accepted. NCCN guidelines consider both approaches (emergency colon resection with primary anastomosis or elective resection after ileostomy or colostomy) as viable options. [18] While some studies failed to demonstrate any outcome difference between immediate or delayed resection, there is similarly good evidence claiming that a phased strategy is associated with lower mortality and morbidity. [19, 20]

In our study, we noticed an increase in the proportion of patients with right colon cancer who underwent single-stage procedures from the first to the second time interval. Subsequently, the third period of time registered similar rate of single stage procedures as the second time interval. It is noteworthy that a subset of patients

may benefit of the adoption of two-stage procedures to address their clinical requirements. These are patients with colon perforation, peritonitis, patients with altered general status due to comorbidities or long interval from obstruction onset to hospital presentation. These cases were treated with damage control type first procedure followed by the second, definitive surgery. Notably, among the 3 groups, the incidence of postoperative complications did not exhibit a statistically significant increase when compared to cases managed through two-stage procedures. Nonetheless, judicious patient selection for resection with primary anastomosis remains imperative.

Conclusion

In complicated right colon cancer, the standard procedure to perform in emergency setting is right colectomy with ileo-colic anastomosis although damage control type procedures may sometimes provide a safe alternative as first stage of a two-stage intervention.

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